

Pre-work Questionnaire

Mission Requirements and Constraints

Mission Constraints	
Investigation Name	Lightweight Rainfall Radiometer
Target Mission Class	<div>Earth Science</div> <div>If Other, please describe:</div>
Target Lifecycle Cost Range	
Operational Lifetime Requirement	5 years
Operational Lifetime Goal	7 years
Launch Vehicle(s)	Pegasus XL (one per LV) and/or Taurus (2 per LV)
Launch Site	Vandenberg AFB
Other	
Miscellaneous Mission Requirements	
Safety Requirements	
Contamination Requirements	
Mission Reliability Class/Redundancy Philosophy	Selected Redundancy to achieve mission life (Class B)
Mission Technology Goals (If Any)	None
Sensitivities (Radiation, Environment)	
Would You Like Us to Check for Rapid Spacecraft Development Office Compatibility?	<input checked="" type="radio"/> Yes <input type="radio"/> No

Schedule Milestones	
Phase A Completion	2002
Phase B Completion	2004
Instrument Delivery	2006
Launch	2007 (all 3 satellites operational)
Other	

Science Overview

Science Matrix			
	Mission Objective	Performance Drivers	Priority Level (1 = Highest)
1	Provide enough sampling to reduce uncertainty in short-term rainfall accumulations; significant impact on weather prediction and data assimilation	A total of 8 small satellites to provide 3-hour revisit time; Sun-synchronous polar orbit at about 600 km; 3-5 satellites supplied by US/NASA; remainder provided through international & DOD partnerships	1
2	Immediate societal impact to crop yield estimates, water resources, short-term rain forecasts, etc.		
3	Accurate time-averaged estimation of precipitation for climate studies		
4	Severe weather/hurricanes can be monitored on a global basis		
5	Frequent estimates of precipitation to complement future direct estimates of soil moisture		

Mission Architecture

Mission Architecture (Please specify Units for each response)			
	Instrument #1	Instrument #2	Instrument #3
Instrument Name	LRR (Lightweight Rainfall Radiometer)		
Type and Description (Spectrometer, Camera,etc.)	Real Aperture Radiometer (37.0 and 85.5 GHz) Synthetically Thinned Array Radiometer(STAR) (10.7 GHz)		
Targets and Measurements/Instrument Modes of Operation	Global rainfall measurement with 3-hour revisit time		
Heritage & Maturity	IIP/TRL 7 by 2003		
Unknowns/Issues/Concerns			

Mission Characteristics

Mission Characteristics & Operations Concept	
Mission Overview	Global rainfall measurement with 3-hour revisit time
Mission Time Lines (Include Tip-off Rates)	Continuous Observation Schedule
Orbit	
Orbit type	LEO Circular
Altitude (km)	600 Km
Inclination (degrees)	Sun synchronous
Orbit knowledge (m)	~100m (GPS Off-the-Shelf)

Observatory Pointing		
Type (nadir, stellar, other)	Nadir Earth Observing	
Primary observation(s) description	Global rainfall measurement	
Observation(s) duration	Continuous	
Secondary target(s) description		
Observation(s) duration		
Control System Type:	<div>3 Axis Stabilized</div>	
Boresight Pointing Accuracy	R/P/Y 0.1 deg 3 sigma (TBD, 0.3 deg max)	
Boresight Pointing Knowledge	R/P/Y 0.1 deg 3 sigma	
Other Axes Pointing Accuracy	SC allocation is R/P/Y 0.07 deg 3 sigma (TBD, 0.2 deg max)	
Other Axes Knowledge	SC allocation is R/P/Y 0.07 deg 3 sigma	
Stability	0.1 deg/0.71 sec (peak to peak) SC allocation 0.07 deg/0.71 sec (peak to peak)	
Avoidance		Angle of Avoidance (degrees)
	<input checked="" type="checkbox"/> Sun	Cold Space View
	<input type="checkbox"/> Earth	
	<input type="checkbox"/> Moon	
	<input type="checkbox"/> None	
	<input type="checkbox"/> Other (Please Explain)	
Slew Requirements	Possible rollover for deep space view calibration	
Slew Rate (degrees/minute)		
Timing Requirements	1 PPS provided by spacecraft (GPS grade accuracy)	

Other Observing Requirements	
Ground to Observatory Interaction	
Maximum Operating Time Without Ground Intervention	3 days or more (TBD)
Calibration Modes that Require Ground Interventions	
Acceptable Delay Between On-orbit Observation by Instrument and Availability of Performance Data for Evaluation Purposes	3 hours from observation to science processing complete per previous IMDC Analysis
Scientific Events that Require Change in Instrument Observations by Ground Intervention	None
Acceptable Delay Between Event and Ground Intervention	
Frequency of Science Events	Continuous observations
Coordination of Operations With Other Observatories Required By Ground Intervention	<input type="radio"/> Yes <input checked="" type="radio"/> No If yes, Please Explain:
Contact Time	
Frequency Allocation (if known)	
Downlink Constraints, if any (S, X, Ka, etc)	
Ground Station Limitations, if any	
TDRSS an Option?	<input checked="" type="radio"/> Yes <input type="radio"/> No If yes, Please Explain: Multiple Access

Instrument Data Volume and Data Processing			
	Instrument 1	Instrument 2	Instrument 3
Name	LRR		
Event Rate	Continuous		

Bits/Event			
Peak Rate	86 kbps, margin included		
Daily Data Rate (Includes Instrument Engineering, Science and Data Formatting Overhead)			
Type of Encoding Required			
Acceptable Compression by S/C	Some Lossless Compression Possible		
Downlink Rate, If Known			
Uplink Rate, If Known			
Any Requirement to Generate a Quick Look Data Set	<input type="radio"/> Yes <input checked="" type="radio"/> No If Yes, Please Explain:	<input type="radio"/> Yes <input checked="" type="radio"/> No If Yes, Please Explain:	<input type="radio"/> Yes <input checked="" type="radio"/> No If Yes, Please Explain:
Acceptable Delay Time From Observation to Delivery of Quick Look Data Set			
Instrument Real Time Data Needs (Include Any Playback)	86 kbps, margin included (direct broadcast)		
Acceptable Data Loss(%) - Bit Error Rate			

General operations	
S/C on Board Storage Required	<input checked="" type="radio"/> Yes <input type="radio"/> No If Yes, Please Explain:

	Sufficient to hold 2 orbits of data at EOL
S/C To Instrument Data Requirements (ACS Data, Orbit Data Points, Nodal Crossings etc.) Please note which are real time.	
Level of Autonomy	
Ground Station Preference (If Any)	
Unknown/Issues/Concerns	
Other Mission Requirements	
Please Enter	

Instruments

Instruments			
	Instrument 1	Instrument 2	Instrument 3
Instrument Name	LRR		
Instrument Operations Concepts			
<input checked="" type="checkbox"/> Instrument Pointing and Science Data and Operations same as Observatory. (Go directly to <u>Instrument Description</u>)			
Observation Duration			
Boresight Pointing Accuracy			
Boresight Pointing Knowledge			
Other Axes Pointing			
Other Axes Knowledge			
Stability			
New Technologies			

Other Operational Requirements			
Science Data and Operations			
Sensor Data and Operations			
Timing			
Event Rate			
Minimum Response Time to Event			
Bits/Event			
Peak Rate			
Test Rate			
Unknown/Issues/Concerns			
Instrument(s) Description			
Mechanical			
Mass	49.25 kg (w/ 25% contingency)		
Center Of Gravity, If Known			
Volume (h x l x w)	Please see attached		
Science Field of View	Nadir +- 45 degrees		
Thermal Field of View			
Calibration Field of View	RAR: Anti-solar, 4 deg		
Other Fields of View			
Mechanical Accommodations: (Interfaces,	See attached		

Neighbors, Jitter etc.)			
Electrical			
Data Interface, If Known	1553		
Peak Power (@ 28V)	71 Watts (includes 25% contingency)		
Orbit Average Power (@ 28V)	71 Watts (includes 25% contingency)		
Standby Power (@ 28V)			
Thermal			
Thermal Interface Requirements	Isolated from S/C 1 degree C across instrument plate Operating Temperature Range 20 C (+/- 1 C) Survival Temperature Range 5 - 40 C		
Issues Other - Acoustics/Magnetics/Emissions			
Please Specify	Avoid harmonics of: 10.7 , 37.0 and 85.5 GHz Swath width 1349 km		

Miscellaneous

Miscellaneous Information	
Products	

Trades	Consider fit of optimum science model in Pegasus XL Consider dual launch approach to same orbit with 180 deg phasing
Issues/Concerns	